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ABSTRACT

This study examined the psychological and behavioral determinants of community college library cooperation, primarily through interlibrary loans, in the Washington Community College Library Cooperative. Fifty-nine of ninety-one Washington community college library professionals responded to a questionnaire on attitudes and expected behaviors. A dynamic computer simulation model incorporated organizational and behavioral variables over time to their effect on the organization's utility and future existence. Respondents felt that cooperation is valuable and will increase in importance during the next five years. Applying the criterion that a cooperative activity will be included if 65 percent or more of respondents are in favor of it, the study concluded that the decision group, composed of library directors, selects different options than does the user group of library professionals in the system. Successive tests using the computer simulation indicated that the behavior of individual library professionals, seeking to maximize their libraries' return from cooperative behavior, may contribute to the ultimate overloading and collapse of the cooperative system. A bibliography is appended. (Author/KP)

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COMMUNITY COLLEGE LIBRARY COOPERATION:

A BEHAVIORAL AND DYNAMIC MODEL

by

JOANNE R. EUSTER

A research report submitted in partial fulfillment of the requirement for the degree of

MASTER OF BUSINESS ADMINISTRATION

UNIVERSITY OF WASHINGTON

1977

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ABSTRACT

The psychological and behavioral determinants of community college library cooperation are examined, utilizing an exchange hypothesis. Members of the existing Washington Community College Library Cooperative are surveyed, and results are analyzed, utilizing the Statistical Package for the Social Sciences procedure CODEBOOK.

Applying the criterion that a cooperative activity will be included if 65 percent or more of respondents are in favor of it, it is concluded that the decision group, composed of library directors, selects different options than does the user group, composed of all library professionals in the system.

A System Dynamics computer simulation model of the cooperative is constructed. Successive tests indicate that the behavior of individual library professionals, seeking to maximize their libraries' return from cooperative behavior, may in fact contribute to the ultimate overloading and collapse of the cooperative system.

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CHAPTER I

INTRODUCTION

Interlibrary cooperation is the goal of myriad present organizations large and small. Scarcely an issue of any American journal of librarianship, of which there are many, fails to carry an announcement, description, or discussion of a new cooperative, consortium, agreement or network. The accessibility and relative cheapness of electronic digital computers has made possible at least the glimmer if not the reality of that librarian's dream, the universal union list--in nonlibrarian terms, a huge computerized card catalog containing the holdings of every library in the country--or world! And the fact is that even now the National Commission on Libraries and Information Science is holding discussions on the development of a national "network of networks" which would produce exactly that.

It is worthwhile to note, however, two details. First, the idea of interlibrary cooperation, chiefly in the matter of what is usually called interlibrary loan--the sharing of materials among libraries--has been around for a long time. The convention referred to in the profession as the Interlibrary Loan Code applies to virtually all libraries, and provides a sort of common law by which libraries agree to share materials and in some cases compensate one another for imbalances in reciprocal use.

Second, most of the literature on cooperation at present deals with the mechanics of cooperation: how the data base are

constructed, how cataloging products are ordered and delivered, how the various computer systems can be interlinked, how telecommunications can be utilized to eliminate certain laborious hand processes, and so forth. The presence of The Computer as the central figure in this drama makes it virtually inevitable that the logistics and mechanics of the system(s) are the paramount consideration at present.

However, there is a more fundamental issue. Resource sharing among libraries, at least at present, depends upon an intermediary between ultimate user and the "outside" resource, namely the librarian. Interlibrary loans are conducted between libraries, not between users, or even users and libraries. Whether a request for an item held by another library will be placed depends solely upon the intermediary, and whether the intermediary chooses to do so or not depends upon a host of variables, ranging from the availability of appropriate methods of communications and delivery to the attitude of the librarian toward cooperative use as a principle, to the librarian's expectation that the placement of a request will or will not result in a usable material for the patron.

Problem

The thirteen community college libraries in the Puget Sound Metropolitan region formed a voluntary interlibrary cooperative organization in 1972 for the purpose of sharing resources of all types. The object was to better meet user needs for materials without increasing expenditures. While increased access to the total pool of materials and other resources was considered of primary importance, a second significant feature of cooperation was the speed with which materials could be delivered to member libraries.

The initial services offered included a film booking service, van delivery of materials and equipment, and development of pooled catalogs--or "union lists"--of certain specialized types of materials.

During the succeeding four years, the organization grew with the addition of all community colleges in Washington State, the addition of services such as an audio-visual equipment repair service, an interlibrary loan search service, and finally the hiring of a full-time librarian-supervisor.

Throughout the life of the organization, it was apparent that the funding base, consisting of voluntary subscription fees and small special projects grants from State agencies, was extremely unstable and prevented long-range planning and coordination, since the level--or even existence--of funding was uncertain from year to year. Furthermore, libraries outside the Puget Sound region complained that the existence of the comparatively expensive delivery service meant that Sound region libraries received preferential service. Although the service guidelines of the organization provided for different service levels at various subscription rates, examination of service records revealed that, in fact, those institutions receiving delivery service also received the greatest service from all aspects of the cooperative.

When the Cooperative Board of Directors, composed of the Directors of the cooperating libraries, set about restructuring the cooperative's goals, services and funding pattern in October 1976, this writer proposed to utilize the Cooperative and the Washington Community College libraries to analyze the behavioral bases of formation and duration of cooperative ventures in general. It was hoped that such a study might reveal any significant differences which existed between

the cooperative behavior which could be expected from member libraries, and the behavior which had been anticipated by the Board of Directors in making plans and policy decisions.

Two vehicles for this analysis were employed. First, a survey was constructed and administered to acquire data on the attitudes and expected behaviors of the library professionals of the community colleges, and to summarize their expectations of the services, organizational patterns and funding pattern of an hypothetical cooperative system. Second, a dynamic computer simulation model was constructed to incorporate the organizational and behavioral variables functioning over time to assess their effect on the utility of the cooperative organization and upon its continuance or demise.

A secondary purpose was to explore the value of such a modeling and simulation process for study and understanding of the behavior laden probabilistic systems which are libraries. Previous models, such as those of Reed[1] and Nance and Baker[2] have been both complex and theoretical. Significantly, they have emphasized the mechanical aspects of delivery systems, time delays, ordering procedures and the like.

Scope and Limitations

The data utilized in this study were drawn entirely from the Washington Community College System libraries. The term "librarian" is used throughout; however, it should be noted that in fact, library professionals in this system consist of both librarians and media specialists, and it is this group of library professionals whose behaviors, expectations and opinions were surveyed and are incorporated in the results and in the dynamic model.

It should also be emphasized that the terms "materials" and "resources" are applied equally to books, audio-visual materials, periodicals, equipment and the like. It could, by extension, be applied to shared expertise, personnel, and physical facilities.

In order to be able to test a number of alternative structures, it was necessary to keep the model within the bounds of manageable simplicity. Consequently, a high level of aggregation was required. It was assumed that the average behavior of all libraries was the typical behavior of each library in the system, for example.

The system described herein reflects only the data and hypothesized determinants of behavior appropriate to the Washington Community Colleges; however, it is felt that the basic system described could be adapted to describe any cooperative system, and could incorporate other variables as needed.

The choice of the Community College libraries stems from first, the author's familiarity with that system, and desire to study it in some depth, and second, the fact that the system has attempted repeatedly to form itself into a structured cooperative system, with varying degrees of success, but never for any extended period of time.[3]

Significance

This study is related to and draws from the work of others to some degree. Elaine Sloan[4] describes the application of exchange theory to the understanding of the behavior of library cooperative organizations, and that exchange theory is at the heart of the dynamic system described in the computer simulation.

Michael P. Sinclair[5] has outlined a "typology" of library cooperatives which deals with the underlying differences in various organizational structures and purposes, and relates to Sloan's exchange model with what he describes as the "condition of proportionality."

Finally, the independent and collective considerations and discussions of the librarians and medica specialists of the State of Washington form a not inconsiderable portion of the model, and the author is indebted to all of them for their willingness to share their ideas and opinions so freely.

Methodology

The problem herein described is a two-step issue, and the methodology is likewise in two steps.

First, a survey was constructed and administered to every community college library professional in Washington. Fifty-nine of the ninety-one potential respondents (65.5 percent) replied in time to be included in the results, and in all cases more than 50 percent of those queried in each individual library responded. The complete questionnaire with tabulated results is included in appendix A. Results were analyzed by utilizing the Statistical Package for the Social Sciences[6] on the University of Washington CDC 6400 computer. The SPSS procedures CODEBOOK and CONDESCRIPTIVE provided the tabulations of frequencies, mean, mode, range, maximum, minimum, standard deviation and cumulative frequencies.

The second stage, construction of the computer simulation model, utilized a method known as System Dynamics, which emphasizes the continuous and changing nature of the system under study. The specific method

of application utilized was developed by Jay W. Forrester of Massachusetts Institute of Technology[7] and has been employed to study the behavior of industrial systems, cities,[8] and world population/food supply/resources/pollution.[9] A significant feature of this type of analysis is that it incorporates the effects of time delays in adjusting a system to new information or "feedback." The simulation model utilizes the CDC 6400 computer at the University of Washington in MIMIC language, which is specifically designed for use with System Dynamics models. This type of simulation has been utilized to study such diverse systems as health maintenance organizations, industrial production systems, and educational systems.

Report Organization

This study has been organized into five chapters. Chapter I introduces the general nature of the study, and discusses briefly its purpose, scope, limitations, significance, and methodology. Chapter II discusses in detail the roles, both present and potential, of conceptual and mathematical models in library analysis, and relates that discussion to the present study. Chapter III explains and analyzes the results of the survey of structural and behavioral determinants of interlibrary cooperation. Chapter IV discusses the development of the computer simulation model, relates it to the data gathered in the survey, and elaborates on the altered policy variables in successive simulation runs. Chapter V presents a summary, conclusions, and recommendations for further study. The complete survey and results, and the computer program listing are included in the appendices.

NOTES TO CHAPTER I

[1]Mary Jane Pobst Reed, "Computer Simulation: A Tool for Analysis of Library Service," Journal of Library Automation IX (June 1976):114-136.

[2]Richard E. Nance and Norman R. Baker, "Library Policy Structure: An Industrial Dynamics Study," Simulation X (September 1971):109-123.

[3]Lloyd Williams, "Annual Report of CCLiC Operations, 1975-76" (Community College Library Cooperative, 1976); Joanne Euster and others, "Cost/Benefit Analysis of CCLiC Operations, 1974-75, and 1975-76" (Community College Library Cooperative, 1975-76); Orville Stout, "History of the Community College Library Cooperative" (Community College Library Cooperative, 1976).

[4]Elaine F. Sloan, "Toward an Understanding of Library Cooperatives as Organizations" (ERIC Document ED 047752, 1970).

[5]Michael P. Sinclair, " A Typology of Library Cooperatives," Special Libraries LXIV (April 1973):181-186.

[6]Norman H. Nie, SPSS: Statistical Package for the Social Sciences, 2d ed. (New York: McGraw-Hill, 1975).

[7]Jay W. Forrester, Industrial Dynamics (Cambridge, Mass.: M.I.T. Press, 1969).

[8]Idem, Urban Dynamics (Cambridge, Mass.: M.I.T. Press, 1969).

[9]Idem, World Dynamics, 2d ed. (Cambridge, Mass.: Wright-Allen, 1973).

CHAPTER II

THE ROLE OF MODELS FOR THE STUDY OF LIBRARIES

A brief digression is in order at this point, regarding the role and value of models in the behavior-laden, imprecise organizations known as libraries. Those of us who work in library situations have been for many years concerned to find ways to quantify or at least represent what we do in quantitative terms. Yet we have been reluctant to give up our grasp on the qualitative valuations of the work, which we insist defy quantification. Our plea is "Give us numbers!" followed by, "If you can quantify what we do, you don't understand it!" Nevertheless, we are painfully aware of the measurers and accountability-seekers closing in upon us. Furthermore, as we develop the Washington Library Network (to name the geographically closest example; any of the several computer-based systems has the same capabilities), the realization is upon us that quantification may suddenly be a simple matter. Hitherto our efforts have been limited almost entirely to counting: books, patrons, circulations, dollars, hours of opening, chairs. The nearly limitless capability to keep track of infinitesimal details, arranging the information in virtually limitless combinations and relationships is almost upon us.

If we become entranced with the ability to manipulate information without resolving the basic questions of what and how to quantify in order to truly represent the library function, we shall have lost a

great opportunity. We need to look at our behavioristic situation and decide how to represent it in terms of measurable inputs and outputs.

The idea of a representation of what goes on in an organization or a part of an organization is a model. The first task of the model-maker is to decide the function of the model, and what sorts of uses are expected from it.

My suggestion is that the modeling process, at this stage of library development, is far more important than the model itself. For convenience, however, I shall refer to both the process and the product as "the model."

The model has several possible uses. A highly deterministic model, such as Economic Order Quantity or one of the queueing models, can be applied, to libraries as well as factories, and made to produce a precise numerical "answer." Such a model is the end product of a careful process of analysis of how the system modeled works. Jay Forrester[1] says that one principal use of system dynamics models is understanding of the system modeled. It would appear that a field such as librarianship, which is not quantitatively oriented, needs to teach itself to use quantitative models slowly. A possible line of progression might be development of descriptive models, followed by quantitative models based on ordinal values for behavioral variables (e.g., more than, less than). If such quantification is possible, a last stage might be cardinal quantification of those aspects which lend themselves to enumeration.

One error such a cautious approach would avoid is what Machol[2] refers to as "The Screwdriver Syndrome"--taking a favorite mathematical

model or analytical framework and applying it relentlessly to all available situations. Two fairly painful examples come to mind. The first is an application by Philip Morse of queueing theory to user browsing of library shelves. Morse[3] postulates a "glimpse rate" (g) reminiscent of submarine scanning techniques to develop a mathematical formula for the optimum number of books on any given subject which should be on the open shelves; this in turn generates a formula for weeding the collection for discards or for low use storage. There is no question that this sort of gymnastic can be performed. The essential questions are, Does this model accurately represent browsing behavior? and, assuming that it does, does the model tell us anything which we did not know anyway?

Closer to home, a study contracted by the Washington Legislative Budget Committee with Arthur Young and Company[4] attempts to define standard labor hours for all library activities. The problem with such efforts is not whether or not the device can be applied to libraries, which prefer to define themselves as quality-intensive rather than quantity-intensive services, but what value they have, if any, in the larger scheme of library operations. Librarians wind up squabbling over whether "Checking in books" does in fact require .0140 standard labor hours per unit while "Answering questions" requires .0542 hours, and completely ignoring the underlying issues. The gap between the conceptual models, which may not even exist, and the quantifiable minutae, needs a bridge of common sense.

Utilizing the concept of model development as a continuum with modeling moving from an initial, conceptual or descriptive stage to eventually a deterministic, prescriptive form, one might propose a

further step: integration of both the conceptual and the deterministic model into human thought processes. In other words, as a given model becomes part of the way in which we think about what we are doing, we cease to see it as a model, and simply treat it as the "normal" way of thinking and talking about a given system. For example, it is so customary to think of organizations in terms of organizational charts, or of many operations in terms of cost/benefit analyses, that such devices are not generally referred to as models, but simply assumed to be the "way things are."

What this implies for library systems is that if librarians are to change the way in which they look at their world, they have to first create a new--or many new--conceptual models, rather than try to force their thinking into molds and models from other fields. If library professionals eventually arrive at models which closely resemble those from other disciplines, they have lost nothing, and have gained a great deal in comprehension. To some extent, the process of rethinking the profession which has accompanied the information and technological explosion of the last two decades is a movement toward creating a revised model of libraries in general. The earliest stage of the modeling continuum is the mental image of the organization and its function.

Models of Interlibrary Cooperation

Regardling interlibrary cooperation specifically, the major emphasis at present is upon networking, generally defined to include computerized operations. However, there has been a lack of concern with the underlying principles of cooperation. The existence of expensive hardware and software may facilitate certain types of cooperation, but

ultimately it is the human user (psychoware?) who determines whether cooperation happens and in what way. What I believe is lacking is a conceptual framework within which to study the dynamics of cooperation, which after all is a good deal more than a shared bibliographic data base. What do we really know about cooperation? Are there behavioral determinants? What are the geographic restraints? At what point do economies of scale cease to balance out time delays? Do librarians tend to cherish the concept of cooperation to the extent that they engage in cooperative schemes which are counterproductive? These behavioristic concerns need to be explored; with such information it may be possible to embark on the development of models of cooperation which clarify the dynamics, not of telecommunications, but of cooperative behavior.

There are many excellent articles published detailing the advantages of interlibrary cooperation, many complete with carefully detailed cost/benefit analyses. It would appear that virtually every librarian believes that "Cooperation" is a valuable concept. Library Literature lists dozens of announcements of new cooperatives, consortia, networks and agreements in every issue. Nevertheless, many cooperative ventures fail. There are also published plaints of user dissatisfaction, reluctance to participate in development of network governance,[5] and the eventual decline and disappearance of small consortia. At least two points of view are possible: first, that there is no inherent problem with cooperative schemes which rise, serve a purpose for a time and then disappear. This might be the case in such situations where the cooperative is formed to implement a specific short-term project, such as the development of a union list, or where the nature of the cooperative

effort is such that it does not require a significant captial investment or substantial changes in the procedures (staff shifts, staff training, recordkeeping, to name a few) of the participating libraries. However, it is hard to justify the value of such ad-hocracies in most present situations. Cooperation at present frequently implies significant shifts of responsibility from individual librari
service centers. The largest and most significant cooperative schemes--the present "Networks"--involve enormous investments in computer and communications technology: at present the Washington Library Network, which still includes only some 57 percent of the State's library resources, has cost $5.5 million for development alone. That cost/benefit projections indicate recovery of investment through direct cost avoidance in only 4.4 years[6] is immaterial. The point is that such an undertaking requires enormous stability and long-term commitment on the part of participants.

An alternative point of view, which this writer espouses, suggests that in establishing cooperative ventures, the emphasis is upon setting up de facto cooperative schemes without truly dealing with the underlying issues of cooperation. The fact that some of the most useful publications about library cooperation deal with either tabulations of present consortia activities or with plans for implementing a cooperative organization lends support to this hypothesis.

Patrick's Guidelines for Library Cooperation[7] is a unique "cookbook" for planning and establishing academic library consortia. Patrick suggests an overall model, based upon Delanoy and Cuadra's[8] earlier survey of academic library consortia, which includes fourteen characteristics by which a potential consortium can be classified. Development

is defined as including four stages: Exploratory, Planning, Development, and Operation and Evaluation. The exploratory and planning phases are described as requiring a total of between eight and sixteen month, before the actual development phase is even begun!

It is doubtful that small consortia devote that much time to systematic exploration and planning. Certainly the Puget Sound Regional Library Consortium/Community College Library Cooperative spent substantially less time; development began in January and by May 1972 the initial funding and service pattern had been established. It was assumed that because cooperative service had long been discussed and because there was a "parent" political body (the Puget Sound Regional Planning Council) supporting the concept, that there was substantial agreement about goals and the means for reaching those goals. In fact, a significant part of the discussions centered around not what should be done, but what could be done given the immediate opportunity.

A useful documentation of such a planning approach is included in the West Suburban Hospital Association's lengthy outline[9] of the steps it followed in developing the Consortium for Information Resources between 1972-1974. The CIR study includes exhaustive investigation into the group dynamics, user needs, communications processes, member library profiles, and so forth, of the prospective--and ultimately established--consortium.

The Condition of Proportionality: Exchange Models

On the side of conceptual rather than practical models, Sinclair[10] proposes a "typology" of library cooperation which first attempts to get at the problem of the underlying conceptual model of cooperation, and

secondly proposes to translate the typological model into measurable parameters by means of average marginal cost curves, in the case of what he calls the "service-center model" of cooperative organization. The purpose of utilizing cost curves is to maintain Sinclair's "condition of proportionality," which is essentially the condition of the exchange model: the participating library expects to get as much out of the co-operative as it puts into it, and therefore must pay in relation to the services received. This approach ultimately results in a simple schedule of charges for services rendered. Such a model is useful for cooperatives where the membership is large enough to make strict accounting of "value received" (based on the varying efficiencies of the recipients; obviously, the less efficient organization benefits proportionally more from services than does the more efficient organization when charges are uniform). At the other extreme of Sinclair's typology, the Bilateral exchange model allows for simple one-for-one accounting: Library one lends one book to Library two in exchange for a reciprocal loan, or in the case of imbalance, for an equalizing fee. While Sinclair's models of cooperation do not represent radical departures from present practice, they do help to reorganize thought about the nature of cooperation, which is generally so murky as to gloss over all differences in cooperative schemes, and consequently fails to define cooperation at all.

Sloan's "Exchange Model"[11] of library resource sharing deals with the underlying behavioral patterns. It assumes that resource sharing is a human activity; that as such, the participant has certain expectations regarding the benefits to be received from cooperation,

and will not enter a cooperative arrangement unless there is (1) a perceived need which is not being met, (2) the arrangement is perceived as having the potential to meet, or at least partially meet, that need, and (3) the sum of the "costs" of the arrangement are no greater than the benefits to be received. In short, the arrangement must have expected payoffs. However, the exchange model recognizes that not all payoffs are in terms of better services and increased access to materials. There are certain "non-utilitarian strategy choices" which have to do with belief in the intrinsic value of cooperation, fear of loss of autonomy, etc. The likelihood of formation and survival of a cooperative endeavor is increased materially if there exists "domain consensus" among the participants; this implies that libraries are most likely to cooperate with other libraries sharing important characteristics: the same size and type of collections, substantial user group similarity, and similar user service policies.

NOTES TO CHAPTER II

[1]Forrester, Industrial Dynamics.

[2]Robert Machol, "The Screwdriver Syndrome," Interfaces IV (May 1974):26.

[3]Philip M. Morse, "Library Models, in Alvin Drake, Analysis of Public Systems (Cambridge, Mass.: M.I.T. Press, 1972), 235-256.

[4]Arthur Young and Company, "Factor List, Academic Support, Libraries and Audi-Visual Services" (Washington State Board for Community College Education, 1976).

[5]Maryan E. Reynolds, "Challenges of Modern Network Development," Journal of Academic Librarianship I (May 1975)19-22.

[6]Mary Jane Pobst Reed, "Washington Library Network Cost Avoidance" (Washington State Library, 1975).

[7]Ruth J. Patrick, Guidelines for Library Cooperation; Development of Academic Library Consortia (Santa Monica, CA: System Development Corporation, 1972).

[8]Diana Delanoy and Carlos A. Cuadra, Directory of Academic Library Consortia (Santa Monica, CA: System Development Corporation 1972). Now partially superseded by Donald V. Black and Carlos A. Cuadra, Directory of Academic Library Consortia, 2d ed. (Santa Monica, CA: System Development Corporation, 1975).

[9]Dynamics of Hospital Library Consortia (Waltham, Mass.: West Suburban Hospital Association, Consortium for Information Resources, 1975).

[10]Sinclair, "A Typology of Library Cooperatives," pp. 181-186.

[11]Sloan, "Toward an Understanding of Librarive Cooperatives as Organizations."

CHAPTER III

THE LIBRARY COOPERATIVE SYSTEM

This chapter describes the library community under investigation and the hypothes zed cooperative system, based on survey results. Differences in responses by different population segments are discussed. Finally, behavioral components are described, preliminary to constructing a dynamic model of the interactions of the structural and behavioral variables.

The Survey

A survey, in the form of a written questionniare, was conducted to determine, first, what type of cooperative structure in terms of services offered, personnel required, funding, or other in-kind support available, would have the greatest likelihood of acceptance, and utlimately, of survival. Secondly, the questionnaire sought to give some empirical indications of the answers to such questions as:

1. Given a perception that the hypothetical cooperative was not rendering as much service as the members were paying for, what sort of response could be expected: increased demands upon the services, reduced contributions, or some sort of effort to restructure the organization so as to increase the members' payoffs from membership?

2. What valuation do librarians give to the principle of cooperation? With experience, does their belief in cooperation increase, decrease, or stay the same/ Do they believe cooperation is essential

to service, or an "extra"? Do they believe their users will wait the necessary time for a resource to be delivered from another library?

These questions are all based upon the premise, described by Sloan, discussed in chapter I, that an exchange model of cooperation exists, which requires that the real and expected payoffs from cooperation will be at least as great as the costs of cooperation. It was anticipated that by investigating attitudes, it would be possible to give hypothetical ordinal numerical values to behaviors resulting from certain outcomes, and to build a dynamic model of the total behavior of the cooperative organization and its participants.

The complete questionnaire, which was submitted to every librarian and media specialist in the Washington State Community College System, is included in appendix A, complete with tabulations of results.

Cooperative Structure

What the hypothetical, idealized cooperative would look like emerges from the survey questionnaires. Ninety-one questionnaires were sent out. Fifty-nine questionnaires, or 65 percent, were returned in time for tabulation and inclusion in the results reported here. (Four additional surveys were returned too late for inclusion in results analysis; of the 59 included, every college had returned questionnaires representing at least 50 percent of its staff.)

Survey results were keypunched and analyzed by running them on the University of Washington CDC-6400 computer utilizing the Statistical Package for the Social Sciences, 2nd edition.[1] The procedure CODEBOOK was the primary tool of analysis. CODEBOOK provides frequency distributions, cumulative frequencies in percentage, mean, mode, standard

deviation and range, and also produces a histogram of frequencies. In addition, the program makes automatic adjustment for missing responses, and records the number of valid responses. (See appendix B for selected CODEBOOK tabulations of responses.)

For this analysis, the responses to each question were separately tabulated and analyzed according to the statistics described above. In addition, utilizing the SELECT option, successive runs computed analyses for responses of Library Directors along, for regular staff members alone, and for various geographical groups among the community colleges.

Assuming that all interested library professionals participated in the decisionmaking process, and that the level of interest is identical with willingness to return the questionnaire under discussion, a picture of the types of services, organizational structure, and funding pattern for a cooperative begins to emerge. On a descending scale from 5--Extremely Important--to 1--Of Little Importance--the arbitrary decision was made to include a parameter within the cooperative plan if 65 percent or more of the respondents indicated that that element had an importance level of 4 or above. Obviously, any decision rule could be employed. The 65 percent and 4 or above levels were selected for the purposes of this analysis on the assumption that a high level of agreement and desire for a particular element is necessary to effect and maintain changes from present patterns of behavior.

Services judged by 65 percent of respondents to be very important included:

Reciprocal borrowing privileges for
- books and periodicals
- audio-visual materials
- interlibrary loan

Union lists of
serials
audio-visual materials
special collections

Capability to photocopy any centralized materials

Cooperative reference service, author-title search only

A communications network consisting of mail and SCAN telephone

Weekly delivery service relying on mail and commercial parcel service, which would yield receipt of interlibrary loans within a week of request

Join purchase of selected high-cost items

Personnel training workshops for both professional and clerical staffs

A written method of communicating with members, either by regular newsletter or with irregular bulletins. (Although neither of those two choices fell within acceptance by the decision rule, examination of responses showed that 83 percent (46/59) of the respondents felt that one or the other was very important.)

It was hypothesized that two groups within the larger population might exercise greater decision power than the entire population. The library directors, who in the existing cooperative comprised the board of directors, obviously had more decision power. In addition, because of geographical proximity and more frequent interaction and attendance at board meetings, the directors of Puget Sound region libraries might exercise even greater decision power. Utilizing the SELECT option, the data were analyzed for those two groups alone, as well as for nondirectors alone, Puget Sound region staffs alone, and non-Puget Sound staffs. Results are summarized in table 3-1.

Utilizing the 65 percent decision rule, a cooperative organized by directors alone would delete reciprocal borrowing of audio-visual materials, union lists of audio-visual materials, and joint purchase of

TABLE 3-1

COOPERATIVE OPTIONS SELECTED BY VARIOUS LIBRARY PROFESSIONAL GROUPS, UTILIZING 65 PERCENT FAVORABLE DECISION RULE[a]

	All Respon-dents	Direc-tors	Librar-ians	Puget Sound	Puget Sound Direc-tors	Non-Puget Sound
Loans--books	X	X	X	X	X	X
AV materials	X		X	X		
Interlibrary loan	X	X	X	X	X	X
Centralized storage						
Books						X
AV materials						
Low-use materials					X	
Photocopy	X	X	X		X	X
Union lists--						
serials	X	X	X	X	X	X
books					X	X
AV materials	X		X	X		X
Special collections	X	X	X	X	X	
Author-title search	X	X	X	X	X	X
Subject search						X
Communications						
Mail	X	X	X	X	X	X
SCAN	X	X	X	X	X	X
Delivery-Mail	X	X	X	X	X	X
Parcel service	X	X	X		X	X
Van or truck			X	X		
Weekly	X	X	X	X	X	X
Joint purchase--						
nonprint					X	
Selected high-cost	X		X	X	X	
Info service	X	X	X	X	X	X
Coop preview--						
AV materials					X	
Workshops						
Professional	X	X		X	X	
Clerical	X	X		X	X	
User orientation		X			X	
Coop cataloging					X	
	X=17	X=15	X=16	X=16	X=21	X=16

[a]Those options chosen by 65 percent or more of respondents as "Important" or "Extremely Important."

high cost items. The only item the directors would add is the production or distribution of user orientation packages.

Narrowing the director group to only Puget Sound region directors, reciprocal borrowing and union lists of audio-visual materials would also be eliminated; however, several services would be added: centralized storage of low-use materials, union lists of books, joint purchase of audio-visual equipment, cooperative cataloging services, and, as with the larger group of directors, user orientation packages.

Several questions were designed to discover the preferred funding pattern for a cooperative. The choices were prefaced with "All services and materials derived from cooperation have some 'costs' attached, whether in terms of money, time, or effort expended. My library would most benefit from a payment form that included . . ." Responses to suggested choices were "strongly agree," "agree," "undecided," "disagree," "strongly disagree."

No single funding pattern (money only, staff time only, space only, combination of space, time and money, combinations of time and space, money and space, time and money) was preferred by 65 percent of respondents. However, further examination of the data revealed that when the alternatives "A combination of time and money," and "A combination of time, space and money" were considered in combination, or as variants of the same funding pattern, 73 percent of respondents favored one or the other; this combination had a favorable response of 77.7 percent among directors only, and 85.7 percent among Puget Sound directors.

Among directors, 66.7 percent said that their college administration agreed with their valuation of library cooperation; 40 percent

said that the college administration viewed cooperation as being less valuable than the directors did. None evaluated the college administration's attitude as being more favorable to cooperation than the directors. This does not indicate a pattern of upper administrative influence upon library directors' decisions regarding the cooperative.

While the directors and librarians agreed that cooperation as a principle is highly desirable (100 percent of both groups indicated "agree" or "strongly agree" in principle), and that the advantages of cooperation would outweigh the disadvantages which might accrue (88.9 percent of the total population, 80 percent of the directors), it is unclear to what degree they could expect institutional support for funding a cooperative in the process of balancing available funds and college priorities.

Behavioral Variables

The second set of significant questionnaire results indicated the behavioral components of interlibrary cooperation. According to the hypothesis of this study, the structural and logistical dynamics of cooperative organizations establish only the framework within which cooperative behavior may take place; it is the set of attitudes, expectations and other assumptions on the part of the user-librarian which decides ultimately how, whether, and to what degree the cooperative structure will be utilized to meet patron needs. In this sense, the librarian is indeed the mediator between the resource and the user.

The most important behavioral variables indicated by the survey results are those which indicate not only library professionals' general attitudes toward interlibrary cooperation (one respondent noted, "Apple

pie is good, too!"), but also their expectations regarding the relative value of cooperation as a means of meeting needs when compared to such alternative means as other organizations, traditional interlibrary loan channels, self-sufficiency, substitute materials and the like. In addition, for the survival of an ongoing organization, their expectations for future needs for cooperation are significant.

A second set of important behavioral variables indicates the types of behaviors which can be expected if the perceived payoffs of cooperation do not equal the perceived contributions, which is to say that under the exchange model, some compensatory behavior can be expected if there is an imbalance in the exchange, and some indication of the direction and degree of the compensation is essential. Questionnaire results indicate that:

1. Respondents feel that cooperation in general is a valuable tool for libraries (100 percent) and has increased in importance during the last five years (66.7 percent), and will increase in importance at an even faster rate during the next five years (91.2 percent)

2. The advantages of cooperation are likely to outweigh such disadvantages which might accrue from cooperation as changes in procedures, alterations in ways of thinking about library service, or reassignment of staff responsibilities (88.9 percent) or the potential decrease in immediately available materials due to a library's books and other materials being out on loan to another institution (68.4 percent)

3. There is a marked preference for correcting any imbalance in the exchange model described earlier by increasing demand (80.4 percent) or attempting to influence a change in types and modes of service

offered by the cooperative (85.7 percent) rather than reducing total combined contributions to the cooperative endeavor (19.2 percent). This indicates and supports the bias in favor of cooperation even in the face of a somewhat low return on "investment," as described by the exchange model. It further suggests that the effect of a value/contribution ratio of less than 1--that is, less value received than contribution "paid"--will be to increase use, rather than decrease support

4. Beyond the library professional's personal predispositions to cooperation and the perceived payoffs in increasing the general access level for students and faculty, in the academic library the value structure depends to some degree upon how the library administrator and staff are affected by the attitudes of the college administration in general. It was hypothesized that cooperative organization decisionmakers might temper their enthusiasm for cooperative endeavor if they perceived their respective Presidents and Deans as objecting to either the principle or practice of interlibrary cooperation, or conversely, entering into cooperative efforts against their better judgment in the case of heavy outside pressure to do so

However, as previously mentioned, no respondent felt that his/her college administration viewed cooperation more favorably than did the librarian. Sixty and nine-tenths percent agreed or agreed strongly that their administration viewed cooperation has having the same importance as they did, and 46.2 percent felt that their administration viewed cooperation as being less important. In all cases, the number of undecided respondents was high as was the number of nonresponses.

The unweighted results, summarized in table 3-2, suggests that not even a tentative assessment of the effect of administrative attitudes

can be made. Probably the most likely effect is one of confusion and uncertainty!

TABLE 3-2

LIBRARIANS' PERCEPTIONS OF COLLEGE ADMINISTRATION ATTITUDES TOWARD INTERLIBRARY COOPERATION

My college administration views cooperation as being:	Agree* %	Disagree* %	Undecided* %	Blank* %
More important than I do	0.0	40.7	16.9	42.4
Less important than I do	20.4	30.6	15.3	33.9
Of about the same importance	17.0	13.6	47.4	22.0

*The sum of responses equals more than 100 percent since responses were to three separate questions.

The third important set of behaviors relies upon librarians' expectations that borrowed materials will actually be utilized. A major criticism of sharing library resources, particularly materials (books, films, periodicals, tapes, etc.), is that the delays inherent in the present technology of delivery render the materials of dubious value. This argument holds that the problem is particularly critical where community college students are concerned, since many are either remedial or "vocational" students, who presumably are less likely to return for a requested item than students in a four-year institution or a graduate program would be. In the survey, however, only 35.1 percent of respondents agreed that their users would not return for an item at a later time, and 54.4 percent felt that they would. (The 10.5 percent who were undecided may well indicate the degree of discord among community college librarians on this matter.) However, what is significant here is the

librarians' expectations, since it is upon those expectations that they will act to utilize or not utilize cooperative resources which take time to obtain. Thus, actual resources "shared" imply not only those sent from lending to borrowing library, but those actually claimed by the requesting user. Two factors, then, affect the resources shared level: the ratio of delivery to demand rate is further reduced by the inability of the library receiving the request to respond to 100 percent of requests received (item not owned, out to another user, at bindery, etc.), and the delay between receipt of the request and delivery to the user. If that delay is sufficiently lengthy, the probability that the material will be utilized is reduced. Ultimately, the effects of such delays will also affect the request level, since librarians who feel that their users will not return for materials after a certain length of time will react to experience with time lags greater than the optimum by seeking to meet user demand through alternative methods, utilizing local materials.

Eight-five percent of survey respondents felt that their users would wait up to three days for materials, 79.6 percent felt that a wait of up to one week would result in use, and only 18.2 percent felt that a wait of two weeks was acceptable to users. Translating these results (table 3-3) into subjective probability distributions, we can utilize the librarians' expectations that materials will in fact be utilized if received into future probabilities that they will place such requests, given experience which tells them that the expected wait is a given number of days.

Clearly, at one extreme, with an 80 percent expectation that borrowed materials will actually be utilized after a three day wait, a delivery system which ensured such speed would result in high utilization,

TABLE 3-3

LIBRARIANS' SUBJECTIVE PROBABILITY ESTIMATES THAT A BORROWED ITEM WILL BE USED IF THE WAIT IS:*

Probability of Use	Wait: Three Days % of Respondents	Wait: Three Days Weighted Probability	Wait: Seven Days %	Wait: Seven Days Weighted P	Wait: Fourteen Days %	Wait: Fourteen Days Weighted P
0.0	2.4	0.0	2.0	0.0	13.6	0.0
.25	7.1	.01775	4.1	.01025	54.5	.13625
.50	4.8	.024	14.3	.0715	13.6	.068
.75	38.1	.28575	61.2	.459	13.6	.102
1.00	47.6	.476	18.4	.184	4.5	.045
	100.0		100.0		100.0	
Cumulative Probability		.8035		.72475		.35125

*See survey, appendix A, section II, question 14 a, b, c.

whereas a 35 percent expectation that materials would be utilized if received in fourteen days would indicate that a slower delivery system would significantly reduce utilization.

The perceived level of need for "outside" methods of meeting user needs is the primary motivating force behind initial formation of a cooperative agreement of any type, from the long-standing interlibrary loan code to the most complex network. Librarians were queried as to the capability of their libraries to meet user needs without outside assistance both at present and five years hence. While 33.3 percent said they agreed (but none "strongly" agreed) that they could meet most user needs from their own resources at present, only 5.3 percent agreed

(again, none "strongly") that they anticipated being able to do so five years from now. In a slightly different perspective, only 17.6 percent felt they could adequately satisfy unmet user needs by substituting alternative materials from their own collections. Thus, in considering the value of cooperation, it would appear that the librarians are concerned with the future more than with the present. This expectation of future need would tend to reinforce the predisposition to cooperation.

NOTES TO CHAPTER III

[1]Nie, SPSS: Statistical Package for the Social Sciences.

CHAPTER IV

DYNAMIC SIMULATION OF COOPERATIVE BEHAVIOR

The final stage in the study involved the construction of a dynamic simulation model of the "ideal" cooperative, utilizing the behavioral parameters determined by the survey, plus hypothesized or interpolated indices where behavior was indicated only by "more" and "less." The model, in MIMIC language, was run on the CDC-6400 computer at the University of Washington. Following the initial "base line" simulation run, selected variables were altered to test, first, the significance of those variables, and second, to demonstrate the changes in total system behavior resulting from such changes.

The Model

The dynamic system consists of essentially three interconnected feedback loops. The first of these describes the influence of demand and service level upon the librarian-user's perception of value received and subsequent changes in demand.

In somewhat generalized form, the influence diagram in figure 4-1 illustrates that interaction. The need for cooperative resources, plus the librarian's perception of value received from cooperation, influence subsequent demand. It is important to note that value received alone is not the deciding factor in determining subsequent demand; rather, it is the perception of the ratio of value received to contributions, in all forms--money, space, time, or resources--which affects demand,

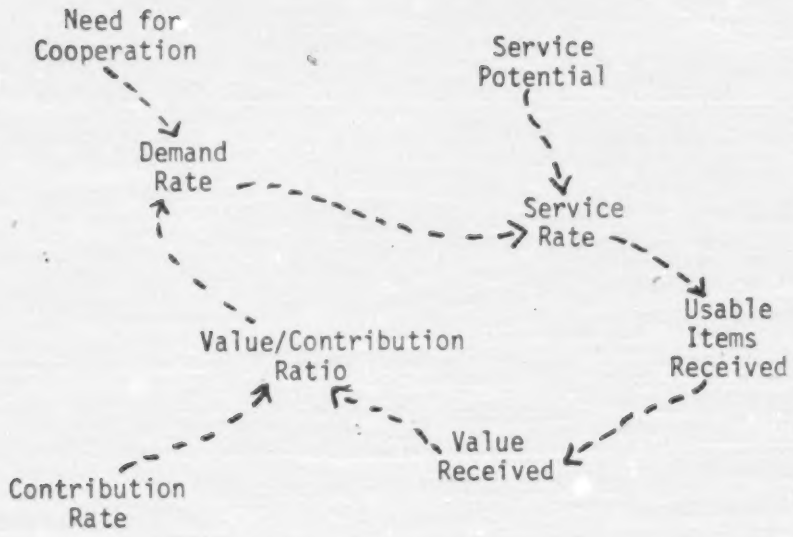


FIGURE 4-1

DEMAND-ACCESS-VALUE LOOP

together with need. This reflects the exchange model described earlier, wherein it was hypothesized that any imbalance between inputs and receipts would result in some sort of compensating behavior to create and maintain equity. As noted in chapter III, librarians showed a decided preference for increasing use (demand) or altering the services of the organization, presumably in order to increase the returns to their libraries, as opposed to decreasing contributions to a cooperative as methods of redressing imbalance.

The second of the dynamic feedback loops describes the interactions among contributions to cooperative endeavors, resulting service, value received, and the adjustments in contributions which result from any perceived imbalance between contributions and value received. This contribution-capacity-value loop, which is illustrated in figure 4-2,

is linked with the demand-access-value loop of figure 4-1 in that both include service rate, usable items received, value received, and value/contribution ratio.

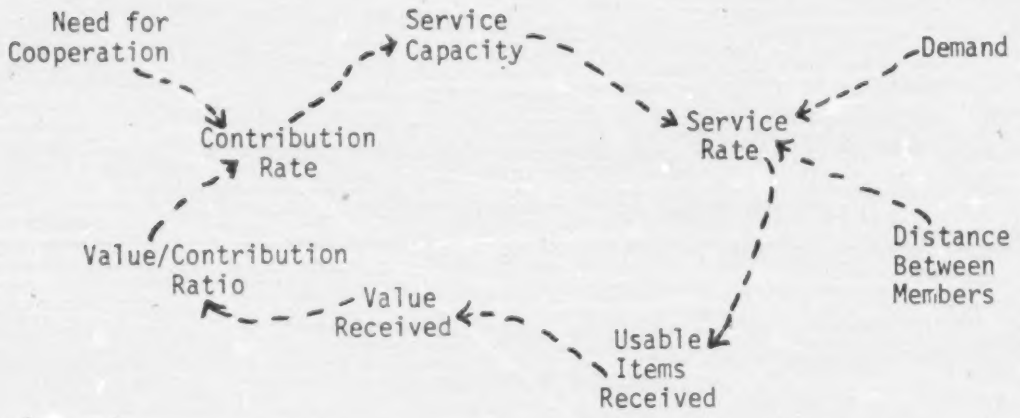


FIGURE 4-2

CONTRIBUTION-CAPACITY-VALUE LOOP

The final, and most significant for this study, set of interactions is the satisfaction-value loop, illustrated in figure 4-3. The components of this loop, together with value from shared resources ("Usable items received"), are the determinants of the librarian-user's perception of value received through cooperative efforts. Personal satisfaction with cooperative efforts is determined in part by various predispositions toward and against cooperation, such as needs for affiliation (+) and autonomy (-), and philosophical bias toward cooperation. In addition, personal satisfaction, particularly in the college environment, is influenced by the librarian's perceptions that the college environment, particularly the upper administration, values the cooperative effort.

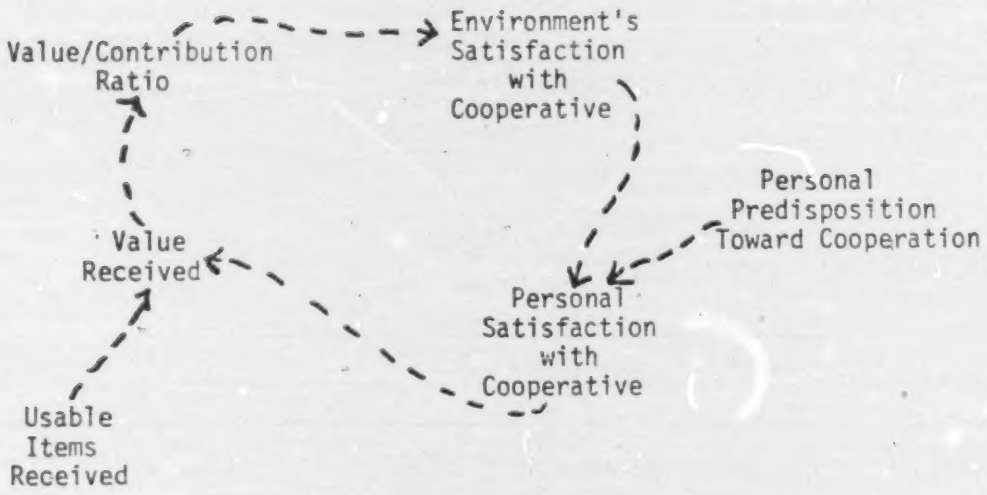


FIGURE 4-3

SATISFACTION-VALUE LOOP

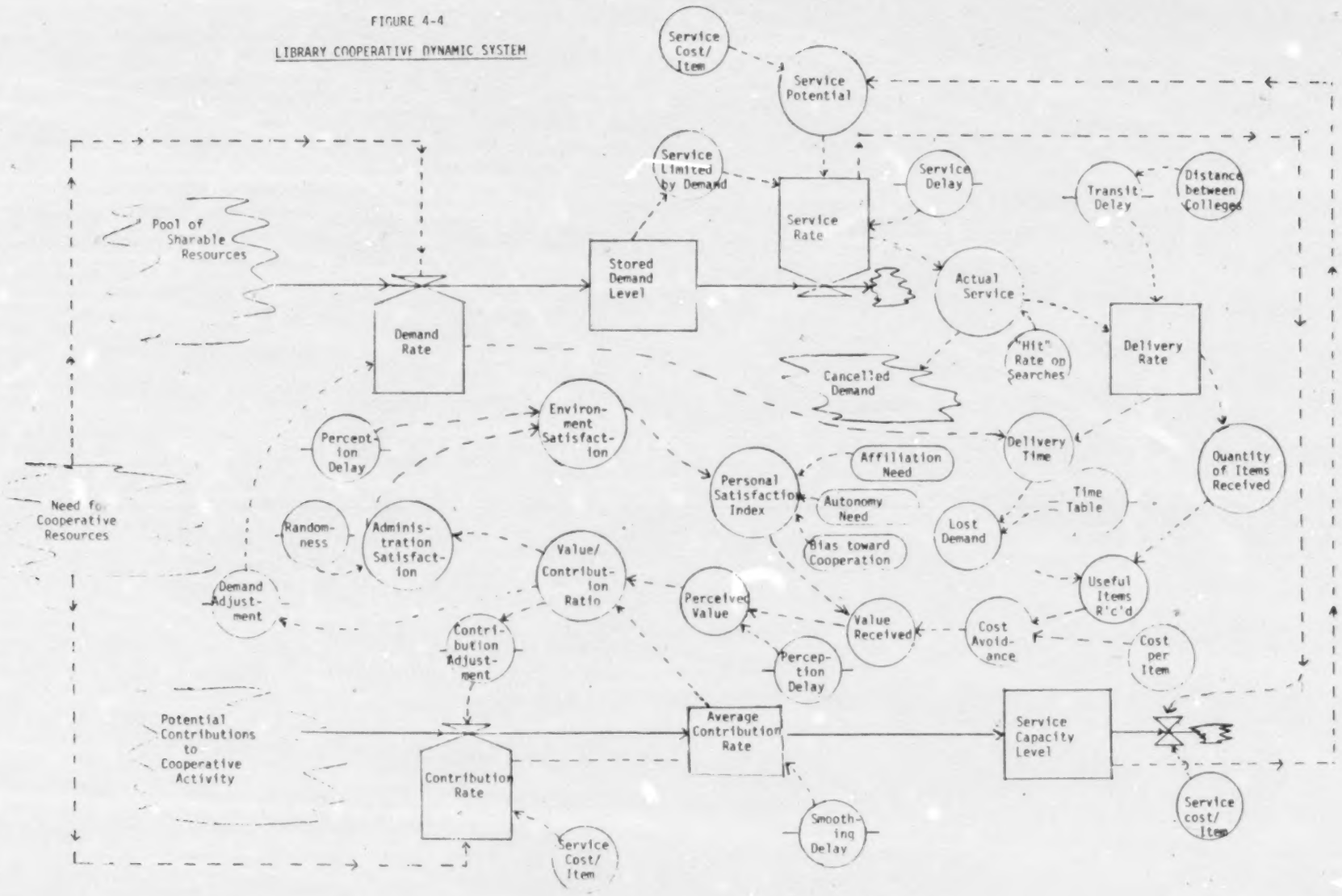
These three influence diagrams can be combined into a single dynamic flow diagram, which is shown in figure 4-4. This diagram, in addition to utilizing conventional system dynamics symbols for rates (itesms/time period) and levels, is further refined by the introduction of several delays, such as the rather obvious transit delay which operates to keep demand from being instantly satisfied. It is also elaborated in somewhat greater detail than the previous diagrams, in that various transition factors are introduced to make the necessary changes from numbers of items to dollars, and vice versa.

Model Refinements and Amplification

It is particularly important to note that although the terms "numbers of items" and "dollars" are utilized for numerical simplicity, in fact these serve merely as proxies for all types of contributions and

FIGURE 4-4

LIBRARY COOPERATIVE DYNAMIC SYSTEM

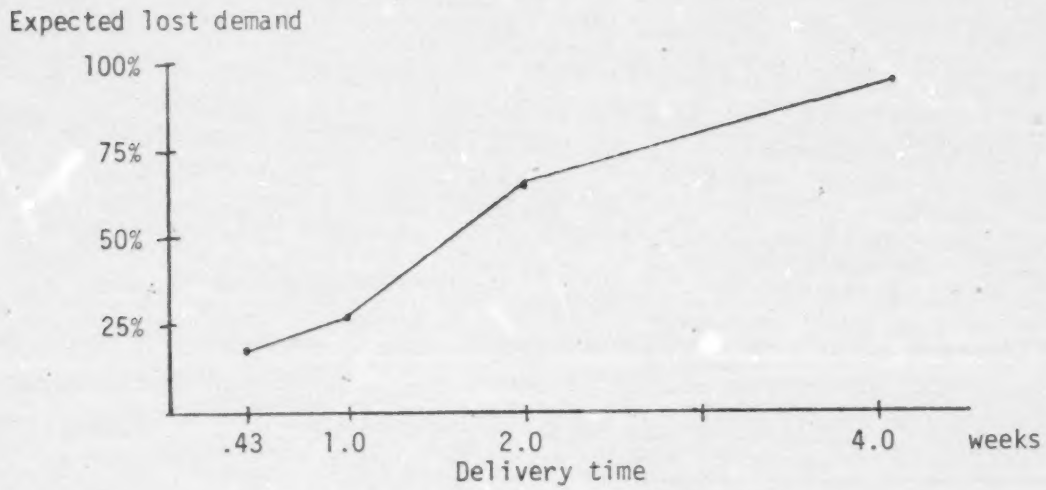


benefits. Resources shared might include materials, expertise, space, services, and a host of as yet unimagined other items. Contributions, as mentioned previously, could consist of money, space for cooperative endeavors, time, or expertise.

"Actual service" differs from "Service rate" in that, although the service rate consumes cooperative resources in the effort to fill demand, not all services rendered result in services received. This is analogous to the "hit rate" in interlibrary loan service. The time and effort of attempting an interlibrary loan are used up, even though the needed item is not found. A hit rate of 80 percent is postulated for the purposes of this model, and the remaining 20 percent constitutes the "cancelled demand" of the model.

"Lost demand" is an important concept, which is based on the librarians' subjective probability estimates that a borrowed item will actually be utilized. The probabilities utilized in this model are derived from the community college librarians survey, and are summarized in table 3-3. The loss of demand is dependent upon time elapsed between request for an item and receipt of it; this relationship is illustrated in figure 4-5.

Demand for cooperative services has been described as a function of two factors, need for cooperative resources and the value comparison which is at the heart of the exchange hypothesis. As previously described, the indicated tendency is to increase use rather than decrease contributions when less perceived value is received than the sum of the value of contributions given. Given that respondents indicated that they felt that their needs for interlibrary cooperation would continue

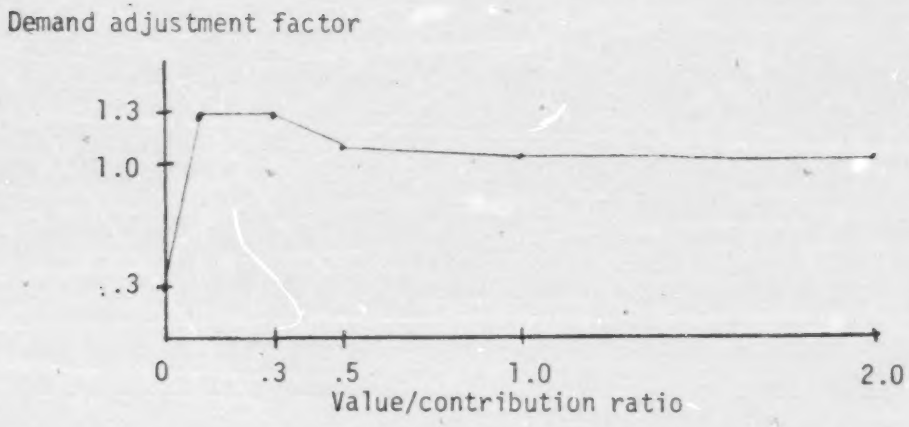


Delivery time in weeks	Expected lost demand in percent
.43 (3 days)	19.66%
1.0	27.525%
2.0	64.875%
4.0	95.0%

FIGURE 4-5

TIME TABLE

to increase, it is postulated that if the value/contribution ratio is equal to or greater than 1.0, users would continue to increase their use of the organization at a steady but minor rate. On the other hand, if the value/contribution ratio were less than 1.0, they would increase their use more significantly. This increase would be limited, in this case by two factors, first, the upper limits on library needs which could reasonably be met by cooperative efforts, and some sort of diminishing returns factor, wherein although demand might increase initially, eventually frustration and discouragement would cause demand to drop to near zero. (See Figure 4-6)



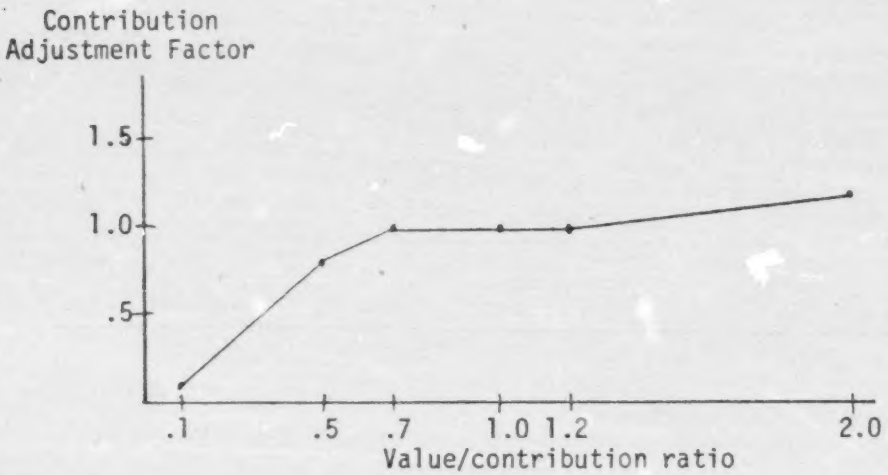
Value/ contribution ratio	Demand adjustment factor
0.0	.3
0.1	1.3
0.3	1.3
0.5	1.1
1.0	1.05
2.0	1.05

FIGURE 4-6

DEMAND TABLE

Similarly, contributions are adjusted in relation to perceived need and to a comparison of value received to contributions rendered. As is the case relative to the demand adjustment factor, the contributions rate will be adjusted downward only in the case of a continuing or further declining low value/contribution ratio. Because of the strong commitment to cooperation in parinciple, it is hypothesized that the contribution rate will never drop to zero, although it will drop to a negligible amount. Further, given a presupposition that there are certain start-up costs, and the expectation of economies of

scale, contributions could not reasonably be expected to increase linearly with increases in the value received (see figure 4-7).

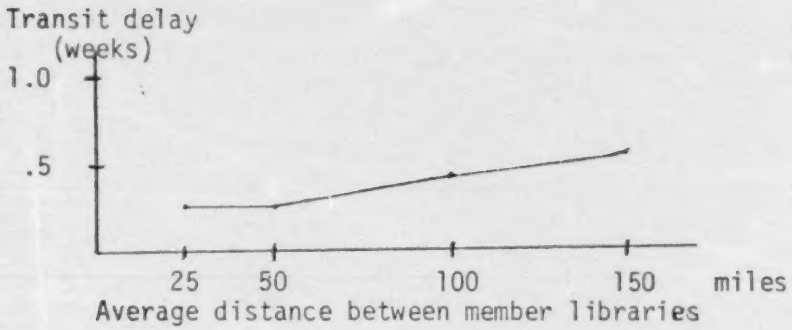


Value/ contribution ratio	Contribution adjustment factor
0.1	0.1
0.5	0.8
0.7	1.0
1.0	1.0
1.2	1.0
2.0	1.05

FIGURE 4-7

CONTRIBUTION TABLE

One further table function is utilized in the model, relating the delay in transporting items from lending to receiving institution. For the purposes of the model, transit delay is considered to be entirely a function of distance between participating libraries (see figure 4-8).



Average distance between member libraries	Transit delay
25 miles	.286 weeks (2 days)
50	.286
100	.429 (3 days)
150	.5719 (4 days)

FIGURE 4-8

DISTANCE TABLE

Other delays utilized in the model are indicative of the perceptual time lags in adjusting opinions and reactions to changed circumstances. The perception delay and environment delay have been set at 13 weeks each to indicate the time which elapses between, in the first instance, changes in value received and the user's assessment of the value/contribution ratio, and in the second, of the librarian's delay in internalizing the college administration's attitude.

The lack of correlation between librarian attitudes toward cooperation and administrative attitudes, at least in the perception of librarians, is indicated by the use of a random number generation technique to vary administrative attitude between favorable and unfavorable in an unpredictable way. This random attitude toward cooperation is combined with the value/contribution ratio to indicate a total administrative attitude based on both personal biases and performance of the organization.

Arbitrary indices of need for affiliation, need for autonomy, and bias toward cooperation in general are introduced to complete the model.

A complete computer listing of the model is included in appendix C.

Dynamic Simulation

The base-line simulation made several additional assumptions: that cost avoidance to member libraries as a result of loans was equal to the total purchase price of a resource; that a medium level of initial satisfaction was indicated by setting the initial perception of value received at $100 per week. Running the model for 104 weeks or two years, resulted in a stable state after 22 weeks so far as the interactions of demand, service, contributions, and deliver time were concerned. Service was equal to demand, and neither excess capacity nor unfilled demand accumulated. These patterns are plotted graphically in figures 4-9 and 4-10. Examination of figure 4-11 shows, however, that the indices of satisfaction and value received rise at an extraordinary rate. By the 104th week, the value/contribution ratio has

FIGURE 4-9 SERVICE RATE, DEMAND RATE, AND DELIVERY RATE

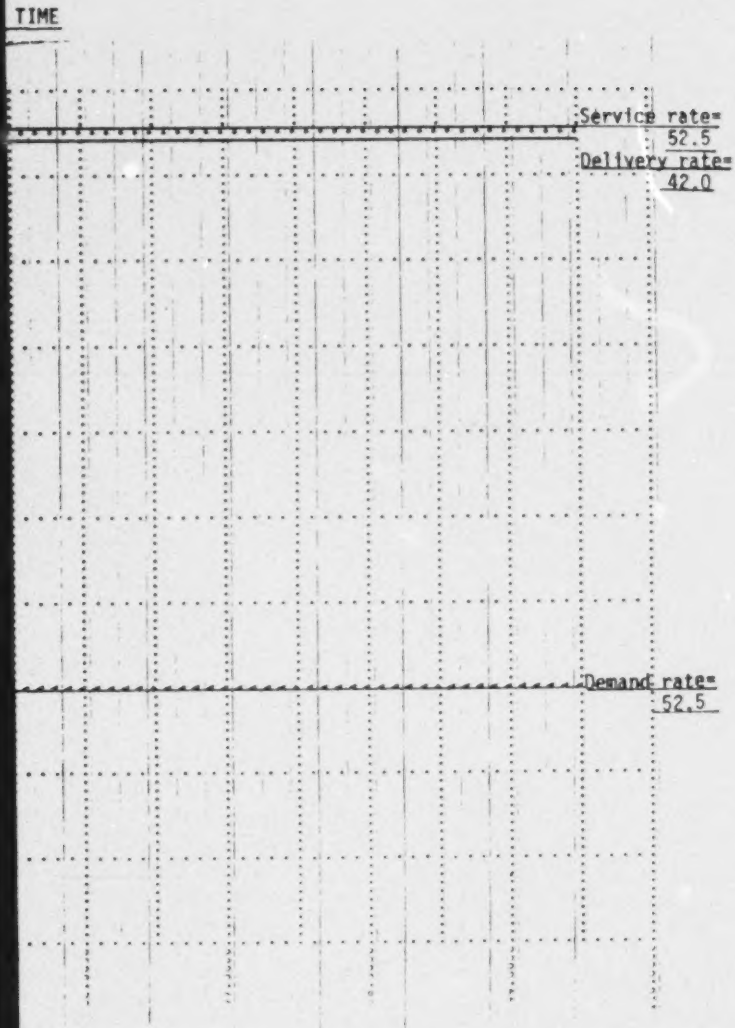
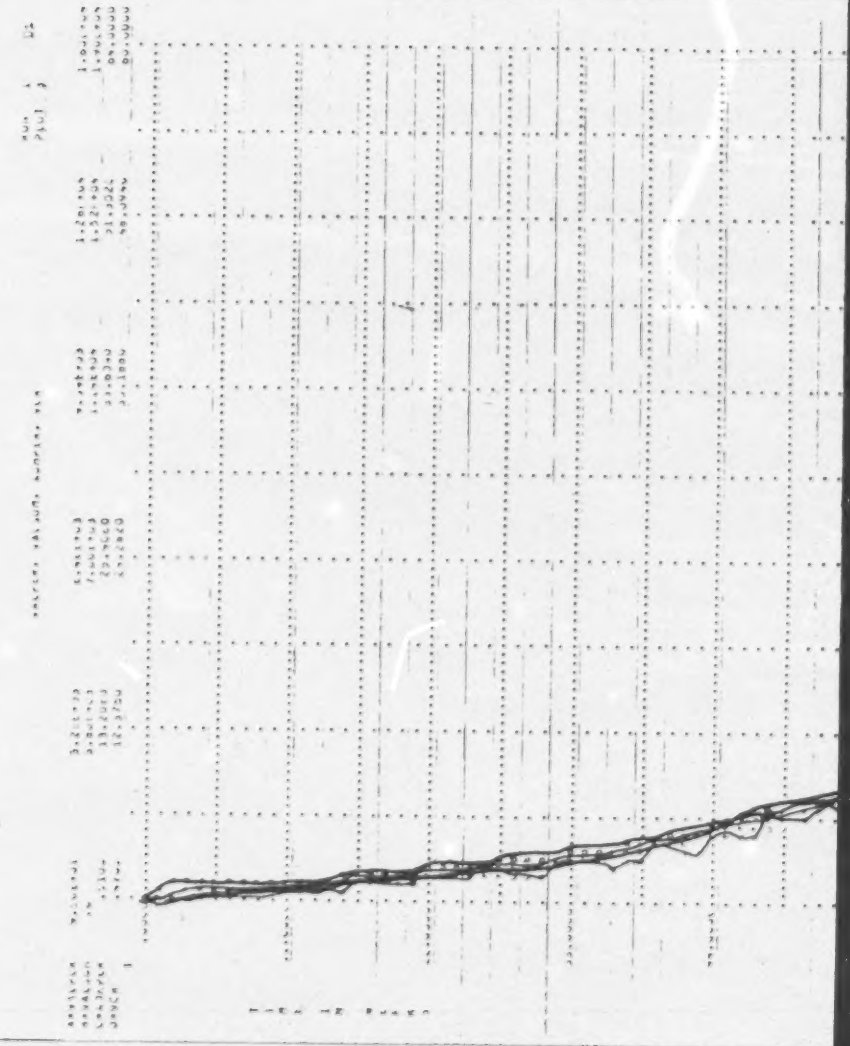

TIME
Service rate=
52.5
Delivery rate=
42.0
Demand rate=
52.5

FIGURE 4-11 VALUE PERCEIVED, VALUE RECEIVED, ADMINISTRAT



PERCEPTIONS OF COOPERATIVE, AND VALUE/CONTRIBUTION RATIO OVER TIME

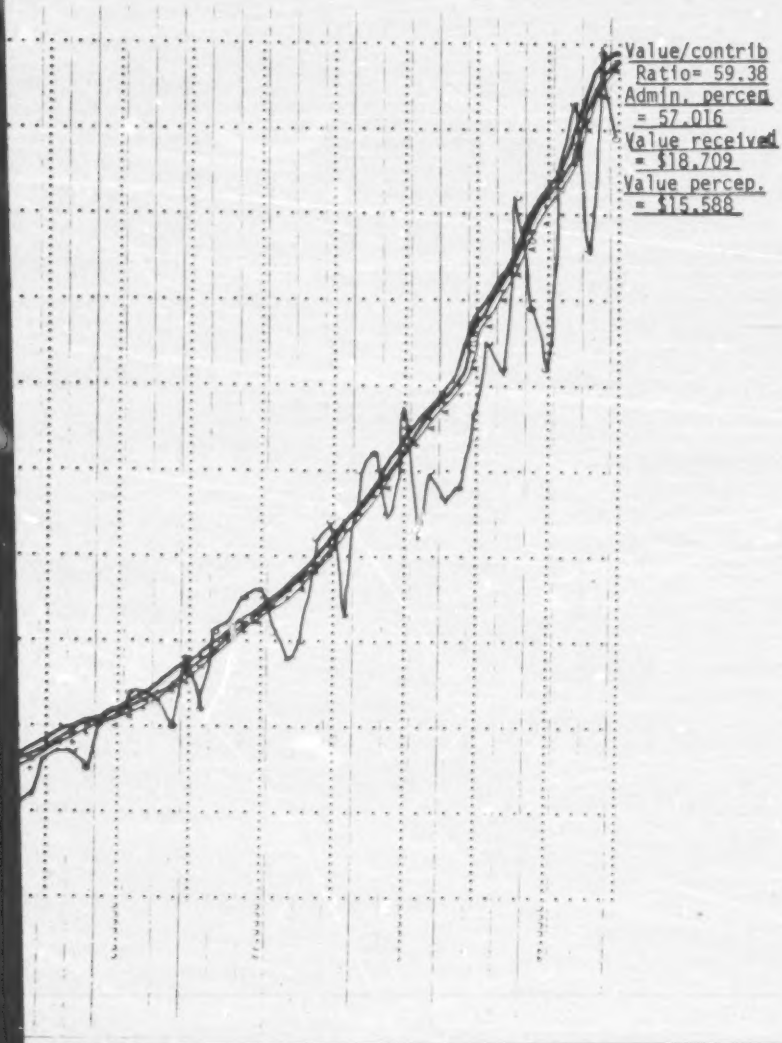
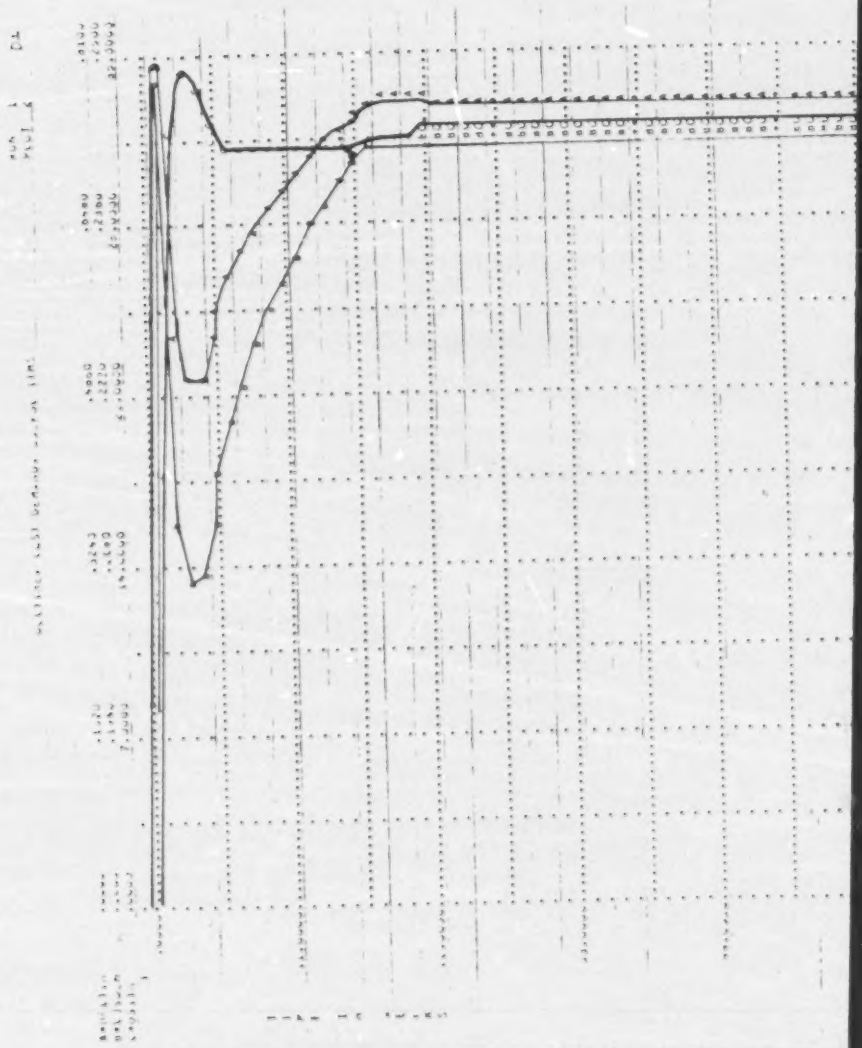
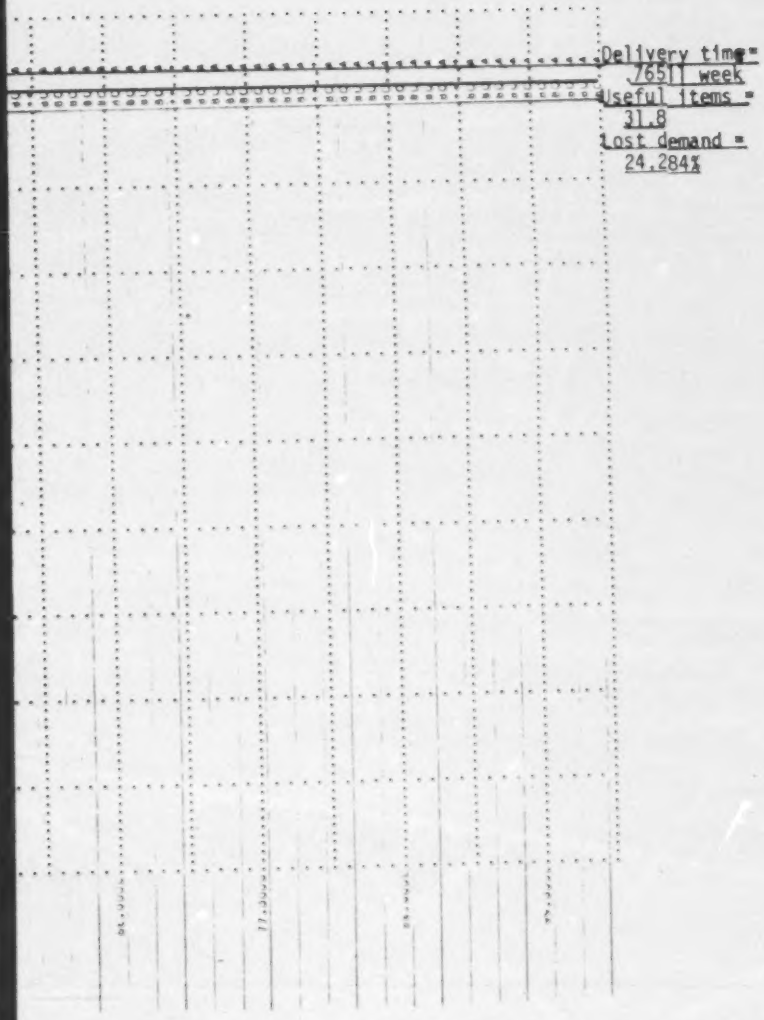


FIGURE 4-10 DELIVERY TIME, LOST DEMAND, AND USEFUL ITEMS



CEIVED OVER TIME



reached 59.382 and is still rising. Since there is no effect of any increase in the value/contribution ratio beyond 2.0 on either demand or contributions, it is possible to regard this behavior as merely indicative of the self-congratulatory nature of the cooperative venture! However, there is somewhat greater significance. The satisfaction-value loop illustrated in figure 4-3 is a positive feedback loop, which is to say that either positive or negative effects are self-reinforcing, and once begun, result in a spiraling effect--either upward or downward, depending upon the initial movement.

Positive Feedback Effects

Since the model postulates a combined Need for Affiliation, Need for Autonomy, and Desire to Cooperate which is greater than 1.0, some other component of the positive feedback loop must be at an extremely low level to override that influence, or the negative, or self-adjusting, feedback from the Demand-access-value loop or the Contribution-capacity-value loop must be sufficiently strong to cause adjustment in the opposite direction. In fact, setting the initial perceived value of the cooperative effort at a very low level, such as $10.00, will cause such an overriding effect; however, this simply sets in motion a downward spiral instead of the upward spiral experienced in figure 4-11.

Setting the perceived cost avoidance at 50 percent of the actual purchased cost of the item, on the hypothesis that a borrowed item does not have the same cost-avoidance value as a purchased item, will also cause a downward spiral not only in value indices (figure 4-14), but results in decreased demand, delivery rates, and contribution rates as well (figures 4-12 and 4-13).

FIGURE 4-12 SERVICE RATE, DEMAND RATE, AND DELIVERY RATE--COST AVOIDANCE = 50%

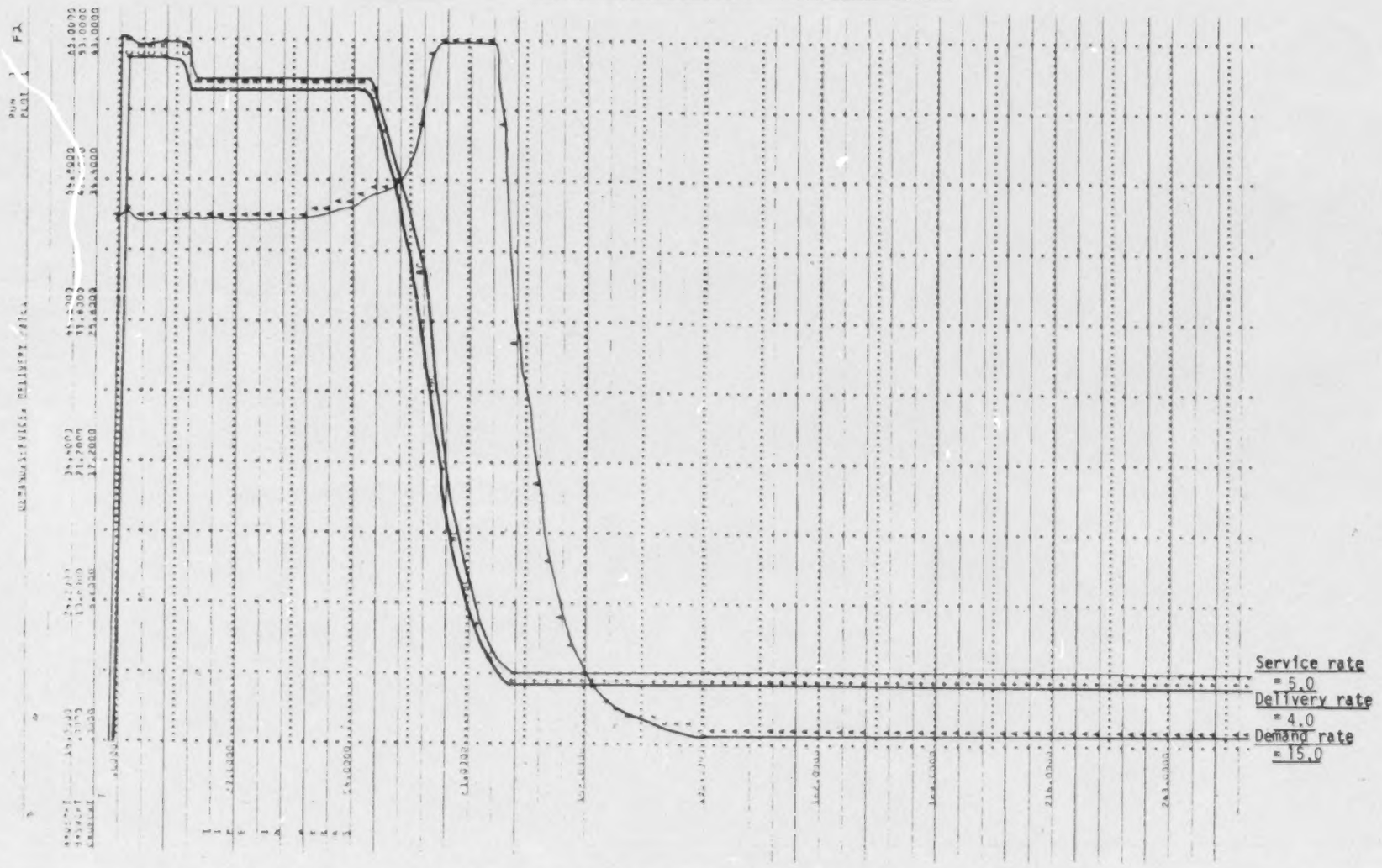


FIGURE 4-13 DELIVERY TIME, LOST DEMAND, AND USEFUL ITEMS RECEIVED--COST AVOIDANCE = 50%

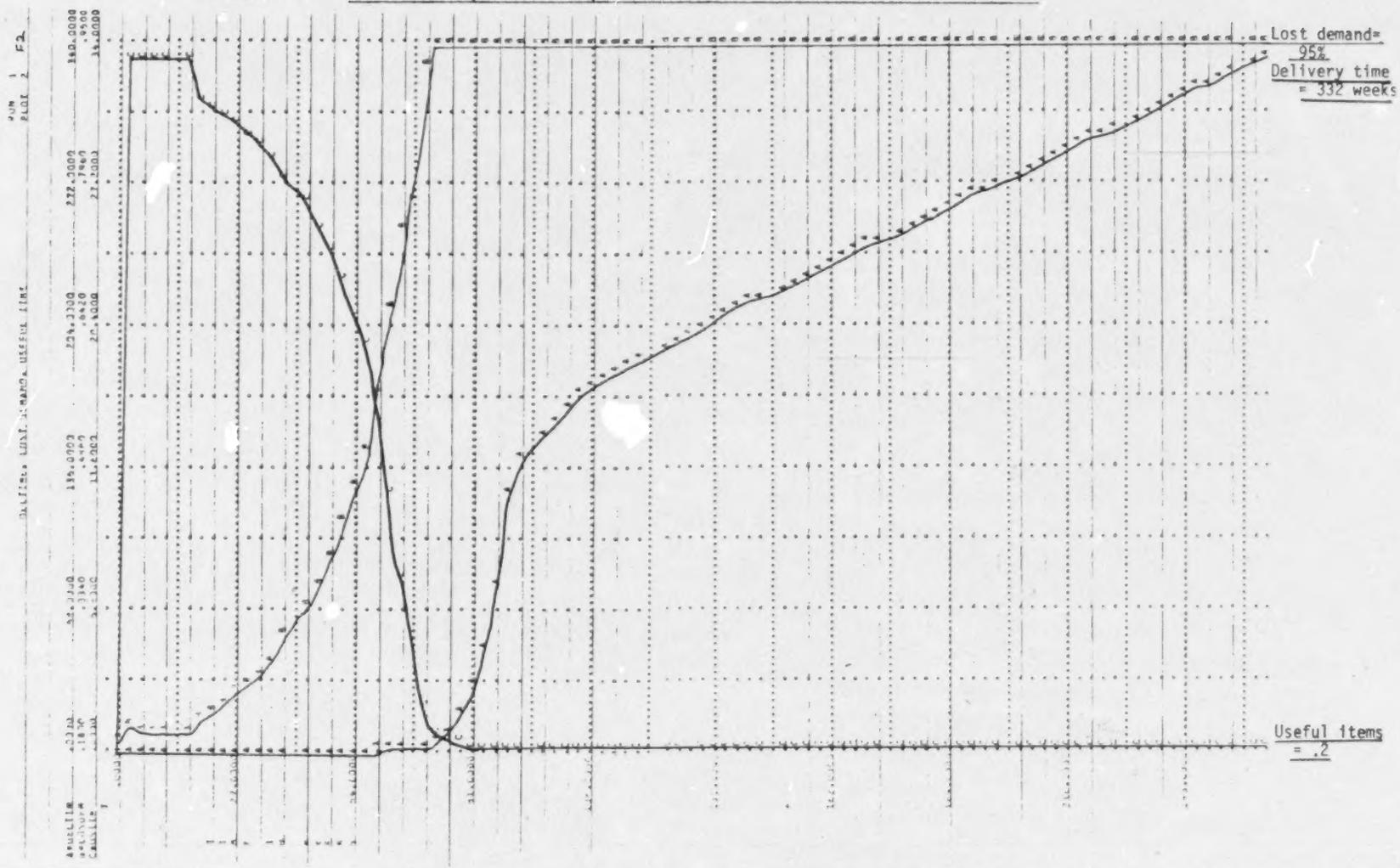
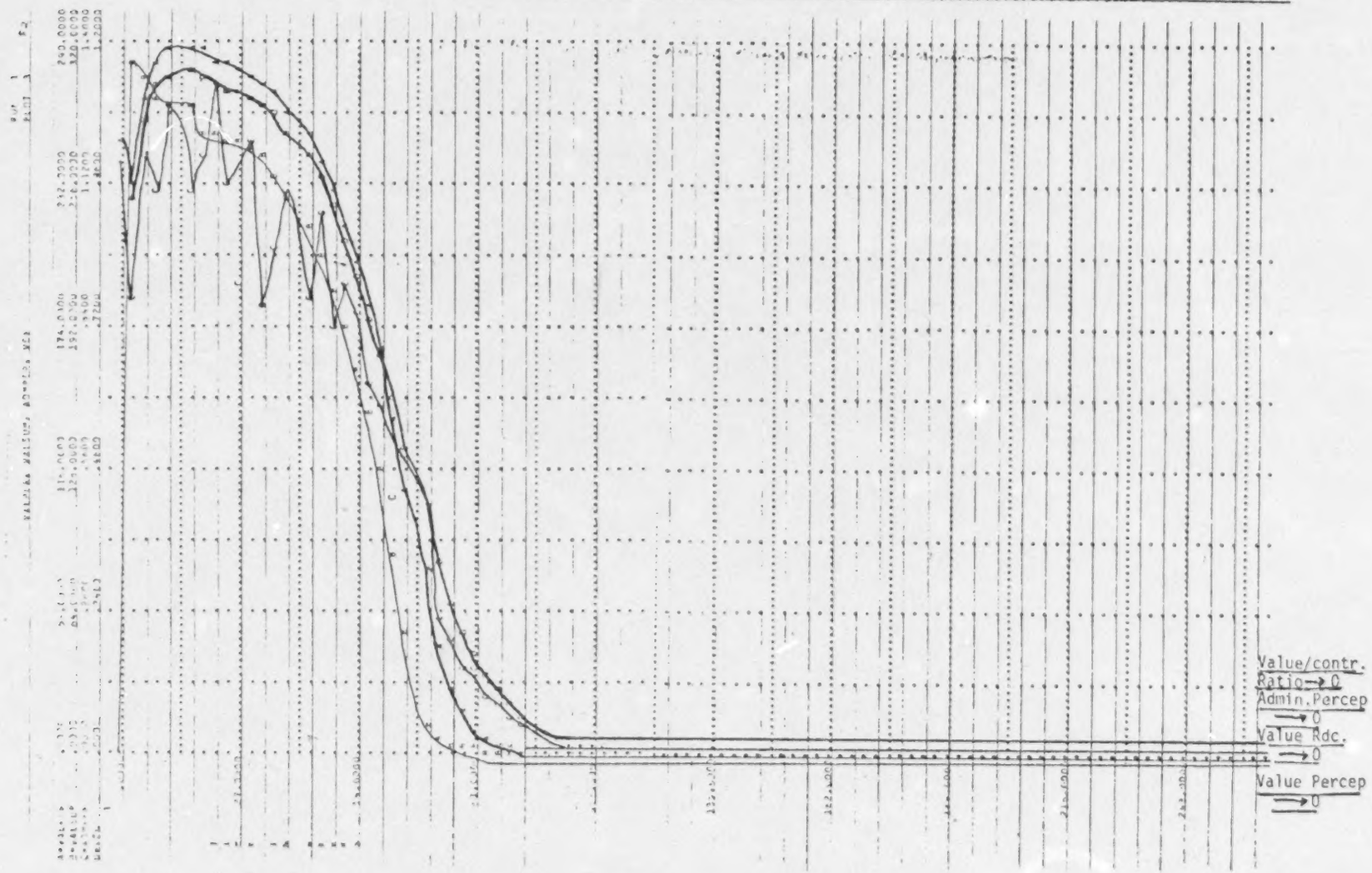


FIGURE 4-14 VALUE PERCEIVED, VALUE RECEIVED, ADMINISTRATIVE PERCEPTIONS OF COOPERATIVE, AND VALUE/CONTRIBUTION RATIO



Exchange Theory Effects

Examination of the effects of both increases in satisfaction, as represented by the Value/Contribution ratio, on the demand rate reveals another tendency toward self-destruction in the model. It should be recalled that librarians stated that they would attempt to restore balance between value and contributions by increasing use, or demand, rather than decreasing contributions. At the same time, it is hypothesized that satisfaction with value received would also result in small increases in demand, and in contributions. The result is a downward trend: increased demand accompanied by steady or even decreasing contributions, which leads to insufficient capacity to meet the increasing demand, results in greater stored demand, longer delivery time, and skyrocketing lost demand!

The reversal of this trend can be seen in figures 4-15, 4-16, and 4-17. In this simulation run, the contribution rate has a built-in adjustment for increased demand (CONTRT=NEED*CONADJ*DEMADJ) and the result is a very stable system wherein demand and service capacity are roughly equal over an extended time period, and the value and satisfaction indices remain within reasonable bounds, although rising gradually. The model is that of a stable and successful cooperative; however, it does not represent the model of voluntary cooperative behavior under the conditions of proportionality postulated by Sinclair or the exchange model of Sloan upon which the initial model is constructed!

What this implies for the cooperative organization is that a non-voluntary organization is more likely to succeed than one in which each user is trying to maximize his/her perceived value received from the

FIGURE 4-15 SERVICE RATE, DEMAND RATE, AND DELIVERY RATE--CONTRIBUTIONS ADJUSTED FOR DEMAND

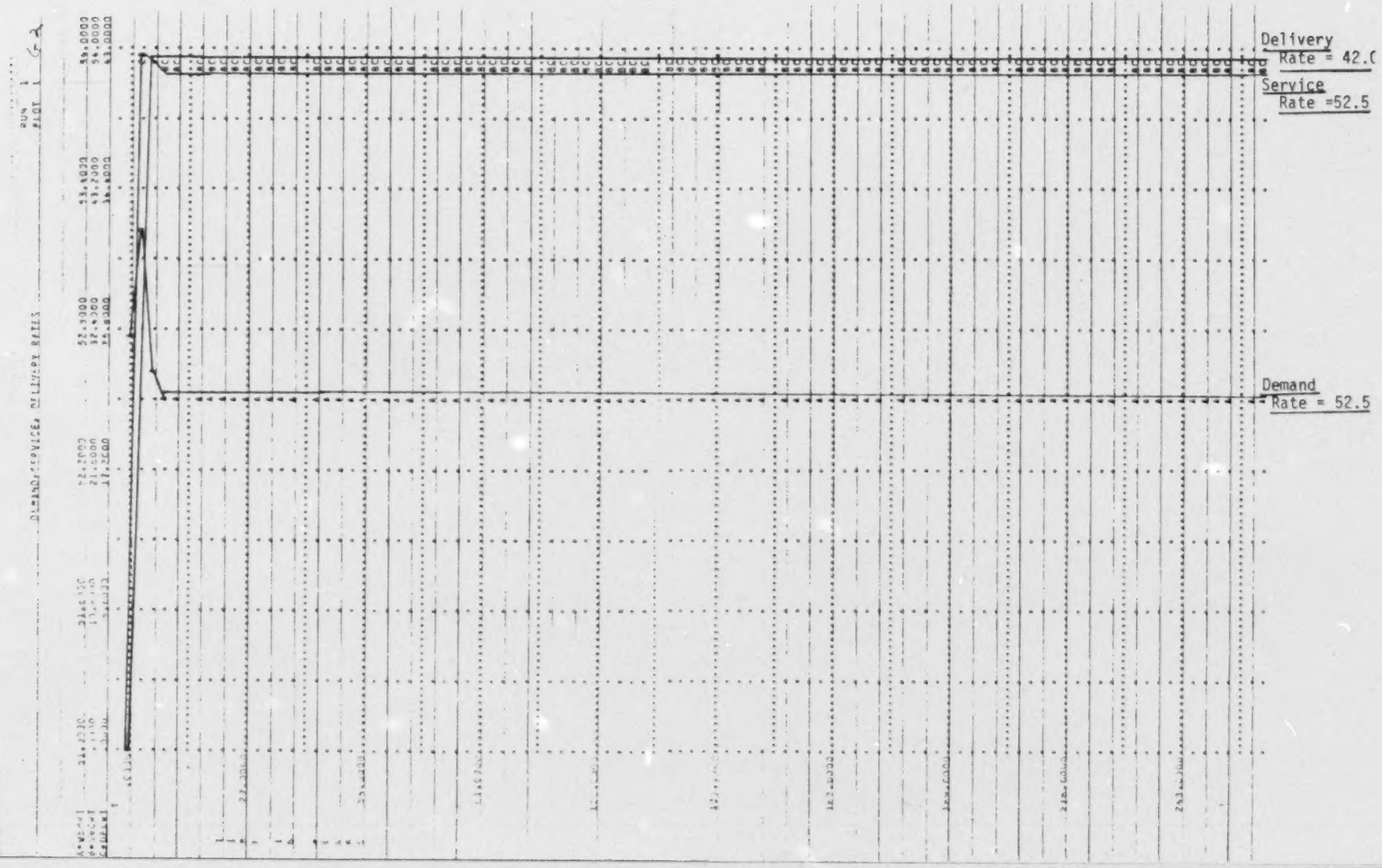


FIGURE 4-16 DELIVERY TIME, LOST DEMAND, AND USEFUL ITEMS RECEIVED--CONTRIBUTIONS ADJUSTED FOR DEMAND

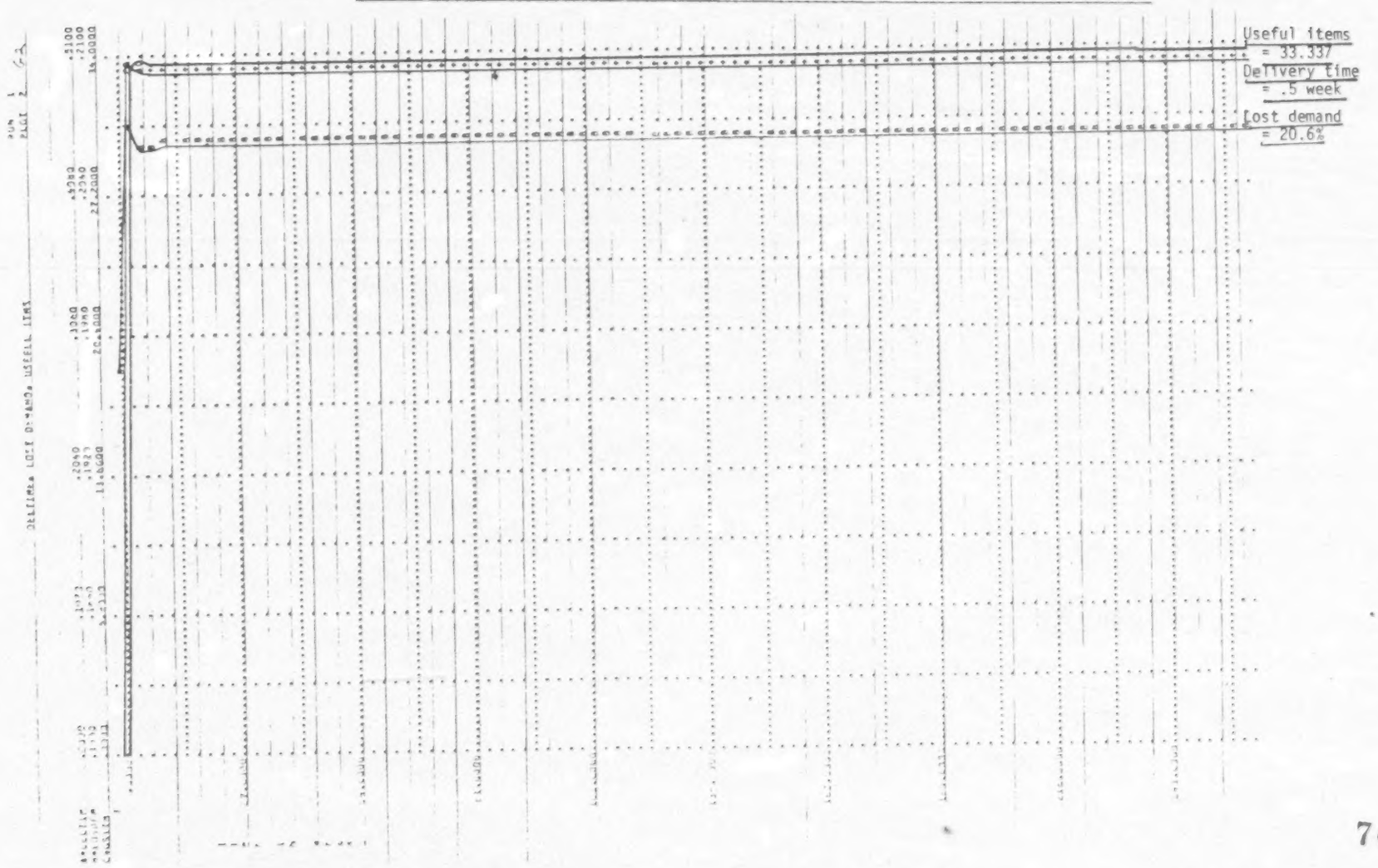
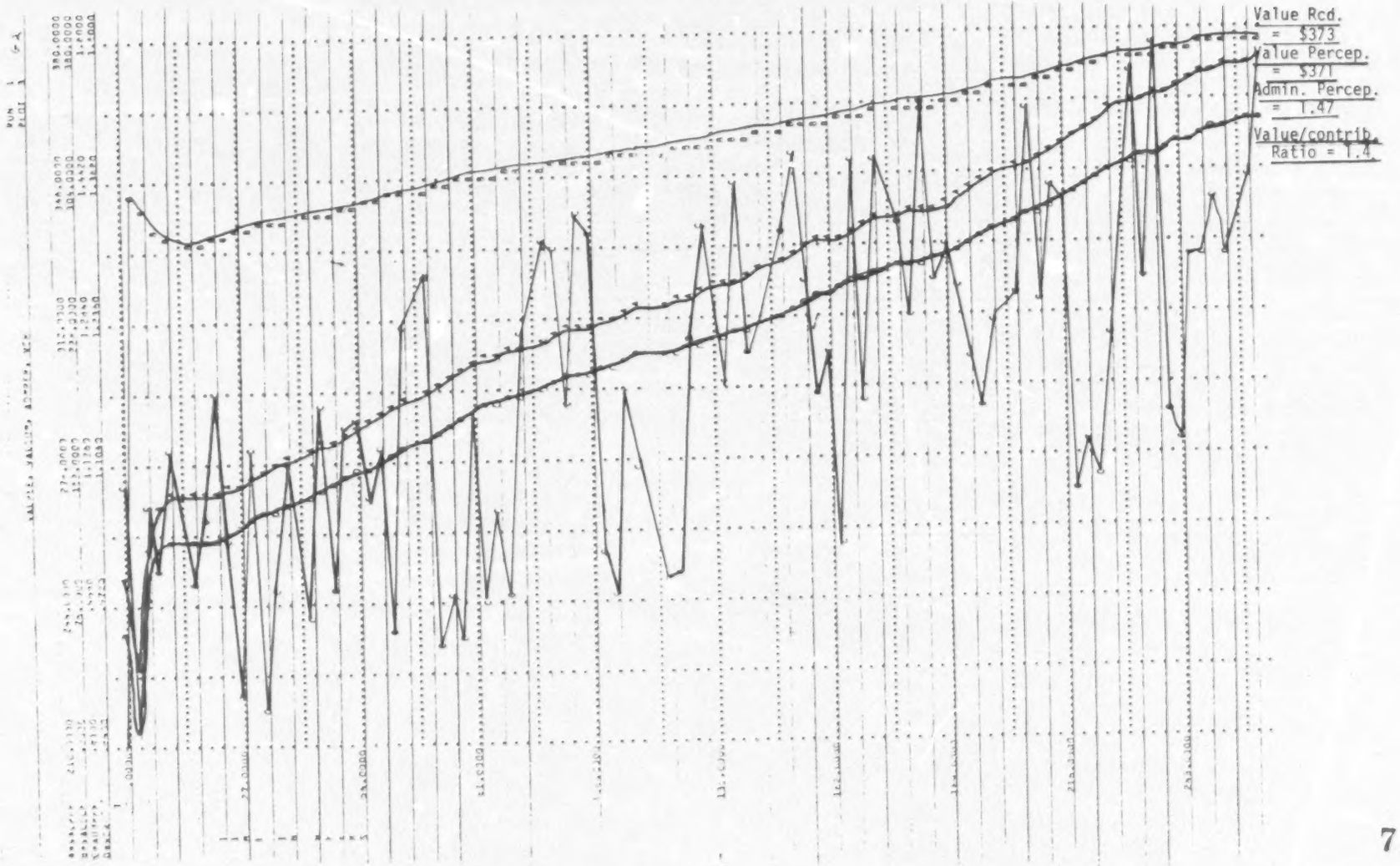


FIGURE 4-17 VALUE PERCEIVED, VALUE RECEIVED, ADMINISTRATIVE PERCEPTIONS, AND VALUE/CONTRIBUTION RATIO



cooperative. Voluntary commitment to the initial organization, long-term membership from which the member cannot withdraw, and a fee-for-service funding basis is one pattern which would respond to the weaknesses of the voluntary system.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study has been based on the premise that the behavioral bases of cooperation are at least as significant as the mechanical and logistical components, yet have been little studied. Further, there has been little utilization of either conceptual or deterministic models to study cooperation. Consequently, this study has attempted to, first, discover and evaluate some of the behavioral determinants of cooperative behavior among library professions, and second, to utilize those data to construct a dynamic model of cooperative behavior.

Cooperative Behavior

The behavioral bases of cooperation were studied by utilizing a survey instrument. The survey population consisted of the library professionals in the Washington Community Colleges. Three major conclusions are drawn from the results described and summarized in chapter III.

1. Community college library professionals in Washington have the expected bias in favor of cooperation as a principle. If the expected exchange model operates, the bias in favor of cooperation appears to cause imbalances in the exchange transaction to be corrected by heavier use, rather than by withdrawal from the cooperative effort, or decreases in contributions to the cooperative. Whether this would be true over extended time periods is a question for further exploration. Enthsiasm for cooperation is to some degree weighed against the time

delays inherent in utilizing materials from a remote source. While clearly speed is of the essence, a delay of up to one week would result in an expected use rate of 72 percent of materials received (or conversely, 28 percent lost demand). Given that the librarian seeks materials outside his/her own library only if they are not readily available there, a 72 percent expectation that received materials will actually be used would indicate significant optimism among librarians that cooperation would substantially increase service

2. There is a difference between the perceptions and expectations of directors and other library professions which deserves further study. If the directors, or a selected group of directors, serve as the decision group for cooperative policymaking, but the group of library professionals as a whole constitute the decision group for behavior, it is possible that policy decisions will have little relevance to actual cooperative behavior. In a test of correlation of differences on policy choices as summarized in table 3-1, utilizing the chi square statistic, only one variable, Union lists of audio-visual materials, showed a significant correlation at the .05 confidence level for the entire distribution of responses. However, since operational policy decisions are not made on the basis of distribution over an entire response range, but on an either-or basis, the simple 65 percent decision rule utilized in the analysis in chapter III is a more realistic representation of the disparity between choices of directors and the library professionals as a whole

3. There is a marked lack of consensus among library professionals as to the degree of upper administrative--that is, college administration outside the library--support for cooperation. If the

contribution level, willingness to participate in cooperation at all, and expectation levels of library professionals are influenced by the general college administration, as hypothesized, this lack of agreement could be expected to have significant impact on the cooperative organization. The scope of this study, however, indicates only that considerable confusion exists, but does not deal with the kind or degree of influence this might have on cooperative behavior. Further study of this dimension is indicated.

Dynamic Simulation

The purpose of the system dynamics method of simulation to study the cooperative system was primarily to shed some light on the usefulness of such a method for study of library problems. Two conclusions here are germane:

1. Clearly, it is possible to utilize system dynamics to model both the mechanical and the behavioral aspects of a library system. However, to be a readily accessible tool, refinements are needed. First, certain commonly accepted representations of behaviors and services are needed. Reasonable levels of aggregation, and measures, or proxies for measures, of services are two obvious such areas. Second, much of the system modeled, and of most library behavior, depends upon attitudes and perceptions of library professionals. Yet this is an area of librarianship about which relatively little is known. The survey method used for this study and the extrapolations drawn from it are, to say the least, crude. The model can be no better than the assumptions and data which are built into it, and much remains to be learned.

However, it is fair to say that, if one accepts the model as constructed, the attitudinal and behavioral aspects of cooperation are even more important than postulated at the beginning of this study. As discussed in the description of the initial computer simulation, the positive, or self-reinforcing, effects of the behaviors resulting from attitudes and expectations can, without other self-regulating mechanisms, completely override all other aspects, and result in either overwhelming "success" beyond all reasonable behavior, or in immediate "failure" due to low satisfaction, not with the performance of the cooperative so much as because of intangible personal dissatisfactions.

The sophisticated behavioral and attitudinal research necessary to determine to what extent individual predispositions of library professionals do in fact influence cooperative behavior is beyond the scope of the present study. It is to be hoped that such research is forthcoming

2. The model constructed and the resulting simulations passed one significant test of model-building: the results were to some extent counterintuitive. The librarians' efforts to get more out of the cooperative system were shown not to be successful in making the cooperative more efficient or valuable, but to contain the seeds of the destruction of the organization

The exchange theory effects described in chapter IV caused users--according to their own predictions of their behavior in a situation of imbalance--to increase demand in the face of slow delivery time and skyrocketing lost demand in their attempts to equalize contributions and value received. It is only when a built-in adjustment for

increased contributions to keep pace with increased demand is introduced that stability is achieved.

What this implies, although far from conclusively, is that purely voluntary payment systems are much less stable than systems in which long-term fee systems are employed, or in which a fee-for-service schedule is utilized.

As a final note, it should be remarked that such counter-intuitive results also suggest that the system dynamics methodology, which has not been heretofore much utilized for the study of library operations, has considerable potential for analysis of library systems, particularly where behavioral and perceptual variables are a significant part of the system.

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